January 18, 2002

Ms. Kristy Chew
Siting Project Manager
California Energy Commission
1516 Ninth Street, MS-15
Sacramento, CA 95814

RE: Data Response, Set 1B
Cosumnes Power Plant (01-AFC-19)

On behalf of the Sacramento Municipal Utility District, please find attached 12 copies and one original of the Data Responses, Set 1B, in response to Staff's Data Requests dated December 10, 2001. As requested by the Commission, we are also filing copies of this Data Response electronically.

Please call me if you have any questions.

Sincerely,

CH2M HILL

John L. Carrier, J.D.
Principal Project Manager

c: Project File
Proof of Service List

COSUMNES POWER PLANT
(01-AFC-19)

DATA RESPONSE, SET 1B
(Responses to Data Requests: 9, 83, 84, 94, 134, and 139)

Submitted by

SACRAMENTO MUNICIPAL UTILITY DISTRICT (SMUD)

JANUARY 18, 2002

CH2MHILL

2485 Natomas Park Drive, Suite 600
Sacramento, California 95833-2937

Technical Area: Biological Resources
CEC Authors: Melinda Dorin and Rick York
CPP Author: EJ Koford

BACKGROUND

In AFC Section 8.2, Biology and 8.14, Water Resources, Clay Creek and the tributaries to Clay Creek are briefly described. The sections state that Clay Creek via Laguna Creek is a tributary to the Cosumnes River, and that the Cosumnes River contains anadramous fish species. In addition, Appendix 8.2B of the AFC contains a letter from NMFS that contains LORS information and a summary of conservation measures, yet the Magnuson-Stevens Act is not listed in Table 8.2-1, no fish species are listed in Table 8.2-4, nor is the National Marine Fisheries Service (NMFS) listed as a contact in Table 8.2-5.

DATA REQUEST

9. Please provide the temperature and total dissolved solids limitations for any threatened and endangered species that may be in the receiving waters.

   Response: This issue is addressed in the memo provided as Attachment BR-9.

TECHNICAL MEMORANDUM

Biological Thresholds and Critical Habitat for Four Endangered Fish Species Downstream of the Cosumnes Power Plant Project Area

PREPARED FOR: EJ Koford

PREPARED BY: Kelly Nielsen / CH2M HILL

DATE: January 15, 2002

This technical memorandum presents the temperature and total dissolved solids (TDS) requirements as well as the designated critical habitat for four endangered fish species relevant to the Cosumnes River downstream of Rancho Seco (See Table BR9-1). These species are the Sacramento splittail, the delta smelt, the winter and spring run chinook salmon, and the steelhead salmon.

Table BR9-1 presents the temperature thresholds, TDS thresholds, and designated critical habitat for the four endangered and / or threatened fish species listed above. Figure BR9-1 presents the general locations of designated critical habitat for each species.

Temperature thresholds for the Sacramento splittail have been established for spawning and range from 9 to 20 degrees Celsius (°C)(USFWS, 1995). No TDS thresholds have been reported for the Sacramento splittail. Critical habitat is described in Table BR9-1.

Initial results from a UC Davis study (Cech and Swanson 1993 as cited in DWR and Reclamation 1994) indicate that although delta smelt tolerate a wide range of temperatures (< 8 °C to > 25 °C), warmer temperatures restrict their distribution more than cold water temperatures. The delta smelt spawns in temperatures ranging from 7 to 15 °C (USFWS, 1995). TDS thresholds have not been reported for the delta smelt. Critical habitat for the delta smelt is described in Table BR9-1.

Winter run chinook salmon require water temperatures between 5.8 and 14.1 °C for successful spawning, egg incubation, and fry development (USEPA, 1993). TDS thresholds have not been established for the winter run chinook salmon. Critical habitat is described in Table BR9-1.

Spring run chinook salmon spawn in temperatures ranging from 10 to 15 degrees C; though eggs will have maximum survival in water which is less than 14 degrees C. TDS thresholds have not been established for the spring run chinook salmon. Critical habitat is described in Table BR9-1.

ATTACHMENT BR-9

The Central Valley steelhead spawns in temperatures ranging from 10 to 15 °C (Moyle, 1976; Wales, 1941; Scott and Crossman, 1973). TDS thresholds have not been determined for this species. Critical habitat is described in Table BR9-1.

TABLE 1
Temperature Thresholds, TDS Thresholds, and Critical Habitat for Threatened and/or Endangered Fish Within Watersheds Downstream of the Project Area.

Species	Temperature Requirement for Spawning	TDS Threshold	Designated Critical Habitat
Sacramento splittail	9-20 °C [a]	None	All of the Delta including the Sacramento River up to and including the lower mile of the American River, and the San Joaquin River as far as Modesto and including the lower mile of the Tuolumne River; Suisun Bay, including Suisun Marsh; Napa Marsh; and all areas fed by Petaluma Creek (CDFG, 2002).
Delta smelt	7-15 °C [a]	None	Spawning habitat in Barker, Lindsey, Cache, Prospect, Georgiana, Beaver, Hog, and Sycamore sloughs and the Sacramento river in the delta, and tributaries of northern Suisun Bay; rearing habitat in the area extending eastward from Carquinez Straits, including Suisun, Grizzly, and Honker bays, Montezuma Slough and its tributary sloughs, up the Sacramento River to its confluence with Three-Mile Slough and south along the San Joaquin River including Big Break; and adult migration habitat in the Sacramento and San Joaquin River channels and their associated tributaries, including Cache and Montezuma sloughs and their tributaries (Jones and Stokes, 2000; USFWS, 1995).
Winter run chinook salmon	5.8-14.1 °C [b]	None	Sacramento River, all waterways and bays westward of Chipps Island to San Francisco Bay, and San Francisco Bay. Specifically 1) Sacramento River from Keswick Dam, Shasta county (River Mile 302) to Chipps Island (River Mile 0) at the westward margin of the Sacramento-San Joaquin Delta (including river water, river bottom and adjacent riparian zone used by fry and juveniles for rearing), 2) all waters from Chipps Island westward to Carquinez Bridge including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Straight (including Kimball Island, Winter Island, and Browns Island) 3) all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge and north of the San Francisco-Oakland Bay Bridge including estuarine water column, and essential foraging habitat and food resources used by winter run chinook salmon as part of their juvenile outmigration (USEPA, 1993).
Spring run chinook salmon	10-15 °C [c]	None	All river reaches accessible to listed chinook salmon in the Sacramento River and its tributaries in California. Also included are adjacent riparian zones, as well as river reaches and estuarine areas of the Sacramento-San Joaquin Delta, all waters from Chipps Island westward to Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Strait, all waters of San Pablo Bay westward of the Carquinez Bridge, and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge (NOAA, 2002).

TABLE 1
Temperature Thresholds, TDS Thresholds, and Critical Habitat for Threatened and/or Endangered Fish Within Watersheds Downstream of the Project Area.

Species	Temperature Requirement for Spawning	TDS Threshold	Designated Critical Habitat
Central Valley steelhead	10-15 °C [d]	None	All river reaches accessible to listed Steelhead in Sacramento and San Joaquin rivers and their tributaries in California. Also included are river reaches and estuarine areas of the Sacramento-San Joaquin Delta, all waters from Chipps Island westward to Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Strait, all waters of San Francisco Bay (north of San Francisco/ Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge (USEPA, 2000).

[a] USFWS, 1995
[b] USEPA, 1993
[c] NOAA, 2002
[d] Moyle 1976, Wales 1941, Scott and Crossman 1973

References

California Department of Fish and Game (CDFG). 2002. Habitat Conservation Planning Branch Website (http://www.dfg.ca.gov/hcpb/species/jsp/ssc_result.jsp?specy=fish&query=Pogonichthys%20macrolepidotus).

Department of Water Resources and U.S. Bureau of Reclamation, Mid Pacific Region (DWR and Reclamation). 1994. Effects on the Central Valley Project and State Project on delta smelt. 134 pp.

Jones and Stokes. 2000. Revised Draft Environmental Impact Report and Environmental Impact Statement for the Delta Wetlands Project. May.

Moyle, P. B. 1976. Inland fishes of California. University of California Press, Berkeley. 405 pp.

National Oceanic and Atmospheric Association (NOAA). 2002. Northwest Regional Office Website (http://www.nwr.noaa.gov/).

Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Bull. Fish Res. Board Can. 184. 966 pp.

U.S. Environmental Protection Agency (USEPA). 1993. Designated Critical Habitat: Sacramento River Winter-Run Chinook Salmon, Final rule. Federal Register/Vol. 58, No. 114/Wednesday, June 16.

U.S. Environmental Protection Agency (USEPA). 2000. Designated Critical Habitat: Critical Habitat for 19 Evolutionary Significant Units of Salmon and Steelhead in Washington, Oregon, Idaho, and California, Final rule. Federal Register/Vol. 65, No. 32/Wednesday, February 16.

ATTACHMENT BR-9

U.S. Fish and Wildlife Service (USFWS). 1995. Formal Consultation and Conference on the Long-term Operation of the Central Valley Project and State Water Project on the Threatened: Delta Smelt, Delta Smelt Critical Habitat, and Proposed Threatened Sacramento Splittail. March.

Wales, J. H. 1941. Development of steelhead trout eggs. California Fish and Game 27(4):250-260.

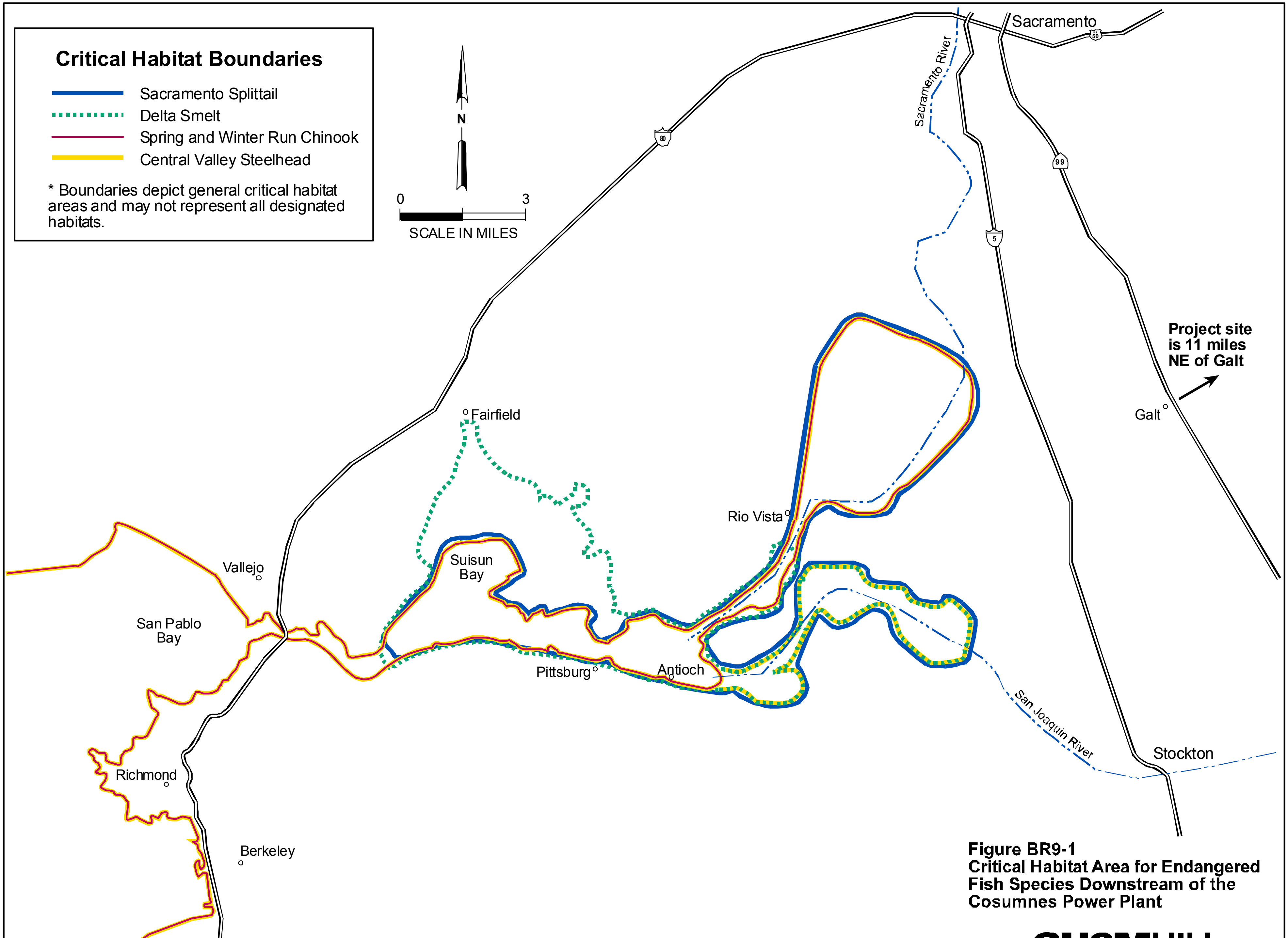


Figure BR9-1
Critical Habitat Area for Endangered Fish Species Downstream of the Cosumnes Power Plant

CH2MHILL

Technical Area: Traffic and Transportation
CEC Author: James Fore
CPP Authors: Jeanne Acutanza

BACKGROUND

AFC Section 8.11.5.3.3 indicates the potential for vapor plumes to be emitted by the facility. There is a potential for visibility impairment to traffic due to vapor plumes produced by the project reaching ground level, or casting shadows that could cause drivers to be temporarily blinded by a sudden change in light intensity. This may affect traffic safety on the local roadways in the vicinity of the project site.

DATA REQUEST

83. Please provide information based on your plume analysis for:

    a. the roadways that might be impacted,

    Response: The only nearby roadway that could possibly be affected by plumes from the cooling towers is Clay East Road. Clay East Road is an eventual dead end into a dirt road that leads to one private ranch property (DeDominico Ranch). All other roads are more than 1 mile from the site.

    b. the expected frequency and duration of traffic impacts from ground fog or shadows, and

    Response: The nearest residential development to the plant site is off Kirkwood Road about 1 mile west of the plant with another small cluster of homes (2 or 3) just over three-quarters of a mile away. There is one other residence about 800 feet west of the CPP site. Therefore, within a ¾-mile radius of the CPP plant the only users of Clay East Road is the one residence and the DeDominico Ranch. CPP is expected to have 20 full-time employees with total daily trips estimated at 40 (employees plus truck deliveries). While ground fog is not expected, if it did occur, there would not be any appreciable roadway traffic affected by its occurrence.

    c. the traffic safety issues resulting from the plumes.

    Response: The cooling tower plumes will not create a significant traffic safety issue in that there would be little traffic in the area, traffic speeds are slow, the prevailing winds are to the east (opposite direction of the residential area) and it is not anticipated that the plumes would be pushed down to the roadway. Even if the plumes are pushed down to the roadway, their smaller size (compared to a fog bank) allows sunlight to penetrate through the plume, thus visibility is not substantially impaired.

84. Please discuss the applicant's plans for mitigating any traffic safety and visibility impacts caused by vapor plumes.

Response: The project will mitigate the remaining impact on the low volume of traffic by painting a white reflective stripe along the edge of the pavement of Clay East Road from Kirkwood Road to the plant site.

Technical Area: Visual Resources and Plumes
CEC Authors: Michael Clayton and William Walters
CPP Author: Wendy Haydon

BACKGROUND

Figure 2.2-2 provides elevation views of the proposed project but does not show structure heights except for the HRSG stacks (though structure heights are provided in a data adequacy response).

DATA REQUEST

94. Please revise Figure 2.2-2 to specify structure heights.

    Response: The Applicant is refining the plant's general arrangement. As a result, some of the equipment has been relocated. Therefore, the Applicant will be preparing an AFC Supplement to address potential impacts of the new plant configuration. Revised elevations with the heights of the key structures will be provided in the AFC Supplement, which is expected to be filed the first part of February, 2002.

Technical Area: Water and Soil Resources
CEC Authors: Philip Lowe, P.E., Greg Peterson, P.E., & Richard Latteri
CPP Author: EJ Koford

BACKGROUND

Section 8.14.5.1 of the AFC describes a detention basin intended to maintain post-development discharges from the CPP at pre-development levels. According to the Data Adequacy Supplement dated November 13, 2001, the detention basin would be designed for a volume equal to the difference between the pre-development and post-development 10-year, 24-hour flood volumes, or 100,000 cubic yards of water. It is presumed that this is an error, and that the actual design volume is 100,000 cubic feet, which would be consistent with the difference in ten-year flow volume between AFC tables 8.14-6 and 8.14-7. According to the AFC Supplement, the detention basin design, which would include an oil/sediment separator, would be consistent with Bay Area Stormwater Management Agencies Association (BASMAA) recommended BMPs for extended detention ponds.

The volume required for an on-line detention basin such as this one is not necessarily the same as the difference in total flood volume. The AFC Supplement states the detention basin would drain in 24 hours but does not give the design discharge from the detention basin nor is the pre-development peak discharge rate given. The detention basin would include a spillway in case of overflow, but the location and design of this spillway is not given. Based on Figure 8.14-4R, it appears the detention basin would be contained by an earthen embankment. Overflow of the earthen embankment, unless protection is provided in an armored spillway, could result in sudden failure of the embankment and release of all detained waters at once.

DATA REQUEST

134 Please provide a hydrologic reservoir routing analysis for the proposed detention basin showing how the basin will achieve the desired reduction in peak discharge rate. What will be the proposed design discharge and time to drain of the detention basin?

Response: The requested analysis is included as Attachment W&SR-134.

139. How will floating oil and debris be removed from stormwater runoff on a routine basis? How will settled solids be removed from the stormwater detention basin without increasing the risk of an effluent violation?

Response: This further clarifies and supersedes Data Response #139 provided in Set 1A, submitted January 9, 2002. Stormwater outside of equipment containment areas would be sheet-drained and collected in underground concrete catch basin vaults of suitable size. Sampling and inspection of the stormwater run-off contained in these basins will be sampled and inspected in accordance with the NPDES and Stormwater Pollution Prevention Plan. Typical sampling and inspection requirements consist of sampling stormwater run off at the first seasonal rain for analysis at a remote laboratory with periodic sampling requirements throughout the rainy season. In addition to the periodic sampling requirements operators will conduct a visual inspection of each catch basin prior to discharge into the detention basin. Upon water quality confirmation, water will be released through a valve from the catch basin vault into the detention basin. If water is not suitable for release, oil would be skimmed off and disposed of by the means appropriate for oil/grease wastes. The water would be re-evaluated prior to release. Sediment and debris will be collected periodically from each catch basin vault. Sediment and debris will be disposed of in a manner suitable for its composition. Water collected in equipment containment areas will be collected in basins and pumped to an aboveground oil/water separator prior to discharge. Sediment, debris and any oil or grease will be collected in the oil/water separator, which would be periodically cleaned to remove all sediment, debris, oil and grease for disposal.

By design, the detention basin is dry between storm events and, therefore, any sediment that accumulated in the basin could be removed during the dry periods, thus eliminating the risk of an effluent violation. Disposition (disposal to sanitary landfill or other site as required) of the collected sediments would be a function of the sediment composition. Periodic sampling of the basin soil would be a normal maintenance operation.

ATTACHMENT W&SR-134

project:	Cosumnes Power Plant	***job no.:***	13578	***discipline:***	Civil
subject:	Detention Basin Routing Analysis			***calculation no.:***	13578-C-1
originator:	L. Gasparetti	***date:***	1/11/02	***file no.:***	
checker:		***date:***		***Sheet*** 1 ***of*** 7 ***Sheets***	

Purpose of Calculation

Provide reservoir routing analysis for detention basin.

Summary of Results and Conclusions Starts in Sheet No. _

Sources of Design Criteria

Sources of Formula and References:

FR-1 Rainfall Depth Duration Frequency for Eagles Nest (Department of Water Resources)
FR-2 Calculation No, 13561-C-1

Record of Issues

No.	Description	By	Date	Checked	Date	Approved	Date	Date Filmed

Preliminary Calculation	X	**Committed Preliminary Design Calculation**	
Superseded Calculation		**Final Calculation**	

A. PURPOSE

See cover sheet.

B. METHODOLOGY

1. Define maximum inflow hydrograph and find maximum difference between areas under trapezoidal inflow hydrograph and desired basin discharge rate.

2. The Rational Method determines the peak runoff:

   Q = CiA, where:
   Q = peak runoff (cfs)
   C = runoff coefficient
   i = rainfall intensity (in / hr) (based on time of concentration, T_c)
   A = contributing area (acres)

C. DESIGN CRITERIA

1. Use 10-year frequency
2. Use "C" for developed site from FR-2: C = 0.70
3. Use "A" for developed site from FR-2: A_{DEV} = 25.2 ac
4. Determine "i" from FR-1: i = max rainfall (in) / T_c(hr)

D. ASSUMPTIONS

1. For the purpose of this preliminary calculation, assume that the intial T_{c0} = 10. Therefore, the runoff from all tributary areas should peak at 10 minutes, which is often considered the shortest practical T_{c0} that produces the highest average intensity.

E. INFLOW HYDROGRAPH

T_c (min)	i (in/hr)	C x A	Q (cfs)
10	1.74	17.64	30.69
15	1.36	17.64	23.99
30	1.02	17.64	17.99
40	0.87	17.64	15.34
50	0.82	17.64	14.46
60	0.76	17.64	13.41
2 hr	0.53	17.64	9.35
3 hr	0.45	17.64	7.94
6 hr	0.29	17.64	5.12
12 hr	0.20	17.64	3.47
24 hr	0.11	17.64	1.94

F. OUTFLOW HYDROGRAPH

Outflow is restricted to the amount of runoff from the undeveloped site:
QUDEV = 0.83 cfs

Sheet 3 of 7
Calc. No. **13578-C-1**
Sourc: **FR-1**
Date **1/11/02**

Rainfall Depth Duration Frequency for Eagles Nest

DWR # A00 2160 34
Analysis By DWR DLA
Data From : DWR, Sac Co Sta # 269

Sacramento County

TB 340:B-3

Latitude 38.485°
Longitude -121.260°
Elevation 100 Feet

Maximum Rainfall For Indicated Number Of Concecutive Days

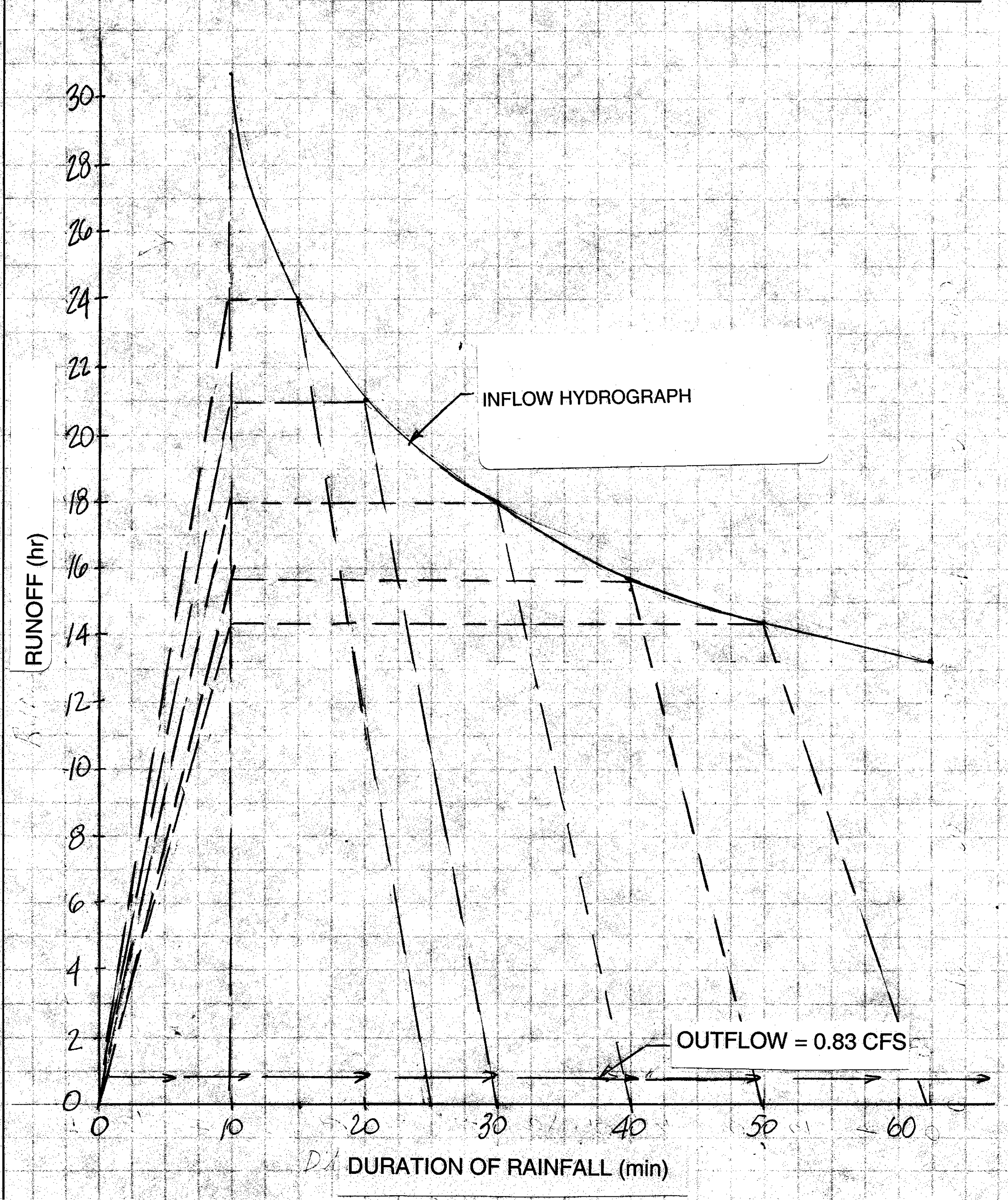
	5 Min	10 Min	15 Min	30 Min	1 Hr	2 Hr	3 Hr	6 Hr	12 Hr	1 Day	2 Day	3 Day	F Yr
1976			0.20	0.34	0.44	0.58	0.83	0.95	0.98	0.98			6.08
1977			0.15	0.24	0.30	0.36	0.39	0.55	0.71	0.82			5.89
1978					0.52	0.97	1.04	1.19	1.32	1.87			21.71
1979			0.13	0.17	0.27	0.43	0.58	0.88	1.03	1.20			15.72
1980			0.40	0.60	0.80	1.13	1.23	1.38	1.51	1.54			21.86
1981	0.05	0.09	0.14	0.18	0.29	0.47	0.61	0.93	1.25	1.64			12.43
1982			0.10	0.15	0.30	0.38	0.51	0.84	1.00	1.47			28.04
1983	0.15	0.20	0.20	0.35	0.65	0.90	1.10	1.40	1.78	2.73			35.89
1984	0.10	0.20	0.30	0.45	0.70	1.04	1.25	1.39	1.95	2.63			19.04
1985	0.06	0.12	0.18	0.36	0.56	0.74	0.91	1.01	1.31	1.32			10.99
1986	0.12	0.20	0.24	0.35	0.51	0.79	1.02	1.61	1.97	2.20	4.02	5.16	16.97
1987	0.04	0.08	0.12	0.24	0.28	0.39	0.47	0.71	1.18	1.73	1.77	2.01	12.01
1988	0.04	0.12	0.16	0.31	0.47	0.55	0.83	1.14	1.85	2.28	2.40	2.40	13.23
1989	0.08	0.16	0.16	0.24	0.39	0.47	0.59	0.79	1.02	1.14	1.50	1.73	14.69
1990	0.16	0.20	0.24	0.31	0.47	0.71	0.87	1.06	1.30	1.30	1.57	1.65	15.00
1991	0.20	0.24	0.24	0.24	0.43	0.63	0.91	1.30	1.57	1.57	1.85	2.68	14.91
1992	0.12	0.20	0.24	0.35	0.59	0.87	1.06	1.46	1.61	1.69	2.32	2.99	15.36
1993	0.16	0.20	0.28	0.28	0.47	0.51	0.63	0.79	1.38	1.81	2.28	0.20	16.45
1994	0.16	0.20	0.24	0.35	0.47	0.59	0.91	1.14	1.18	1.18	1.42	2.42	10.04
1995	0.28	0.47	0.59	0.87	1.02	1.26	1.65	1.97	2.24	2.60	3.03	3.58	26.06
1996	0.16	0.28	0.35	0.63	0.75	1.06	1.14	1.38	5.10	1.97	3.03	3.31	20.86
1997	0.24	0.31	0.31	0.51	0.91	1.18	1.42	1.57	1.85	2.44	2.87	3.31	21.50
1998	0.12	0.16	0.16	0.31	0.43	0.71	0.94	1.46	2.13	2.87	3.50	3.82	31.11
1999	0.08	0.12	0.16	0.20	0.43	0.75	0.98	1.22	1.22	1.38	1.54	2.52	15.36
2000													
Average	.13	.20	.23	.35	.52	.73	.91	1.17	1.60	1.77	2.36	2.70	17.55
Stdev	.07	.09	.11	.17	.20	.27	.31	.34	.85	.59	.82	1.17	7.36
Rec Max	.28	.47	.59	.87	1.02	1.26	1.65	1.97	5.10	2.87	4.02	5.16	35.89
Rec Min	.04	.08	.10	.15	.27	.36	.39	.55	.71	.82	1.42	.20	5.89
Z	3.33	3.93	4.45	4.24	2.75	2.08	2.30	1.94	6.21	1.78	.52	.39	3.37
Yrs Rec	18	18	23	23	24	24	24	24	24	24	14	14	24
CV	.523	.463	.477	.484	.385	.373	.339	.287	.529	.332	.347	.435	.419
Reg CV	.352	.352	.352	.352	.352	.352	.352	.352	.352	.352	1.352	2.352	.310
alc Skew	.6	1.6	1.8	1.6	1.0	.4	.4	.3	3.2	.4	.6	.0	.8
Reg Skew	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	0.4
FIC	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
RP 2	.12	.18	.22	.33	.49	.68	.85	1.10	1.50	1.65	1.79	1.56	17.19
RP 5	.16	.25	.29	.44	.65	.92	1.15	1.48	2.02	2.23	4.75	7.43	21.99
RP 10	.19	.29	.34	.51	.76	1.07	1.34	1.72	2.36	2.60	6.65	11.21	24.72
RP 25	.22	.34	.40	.60	.90	1.26	1.57	2.02	2.77	3.05	8.97	15.81	27.78
RP 50	.25	.38	.44	.67	.99	1.39	1.74	2.24	3.06	3.37	10.63	19.11	29.85
RP 100	.27	.41	.48	.73	1.08	1.52	1.90	2.44	3.34	3.68	12.23	22.29	31.78
RP 200	.29	.45	.52	.79	1.17	1.64	2.06	2.65	3.62	3.99	13.79	25.39	33.59
RP 500	.32	.49	.57	.87	1.29	1.81	2.26	2.91	3.98	4.38	15.84	29.46	36.00
RP 1000	.34	.52	.61	.92	1.37	1.93	2.41	3.10	4.24	4.67	17.30	32.36	37.49
RP 10000	.41	.63	.73	1.11	1.65	2.31	2.90	3.72	5.09	5.61	22.13	41.96	42.56

$i = \frac{\text{max rainfall}}{\text{hr}}$

PARSONS BRINCKERHOFF COMPUTATION SHEET

Subject: SMUD – Consumnes Power Plant Detention Basin Routing Analysis

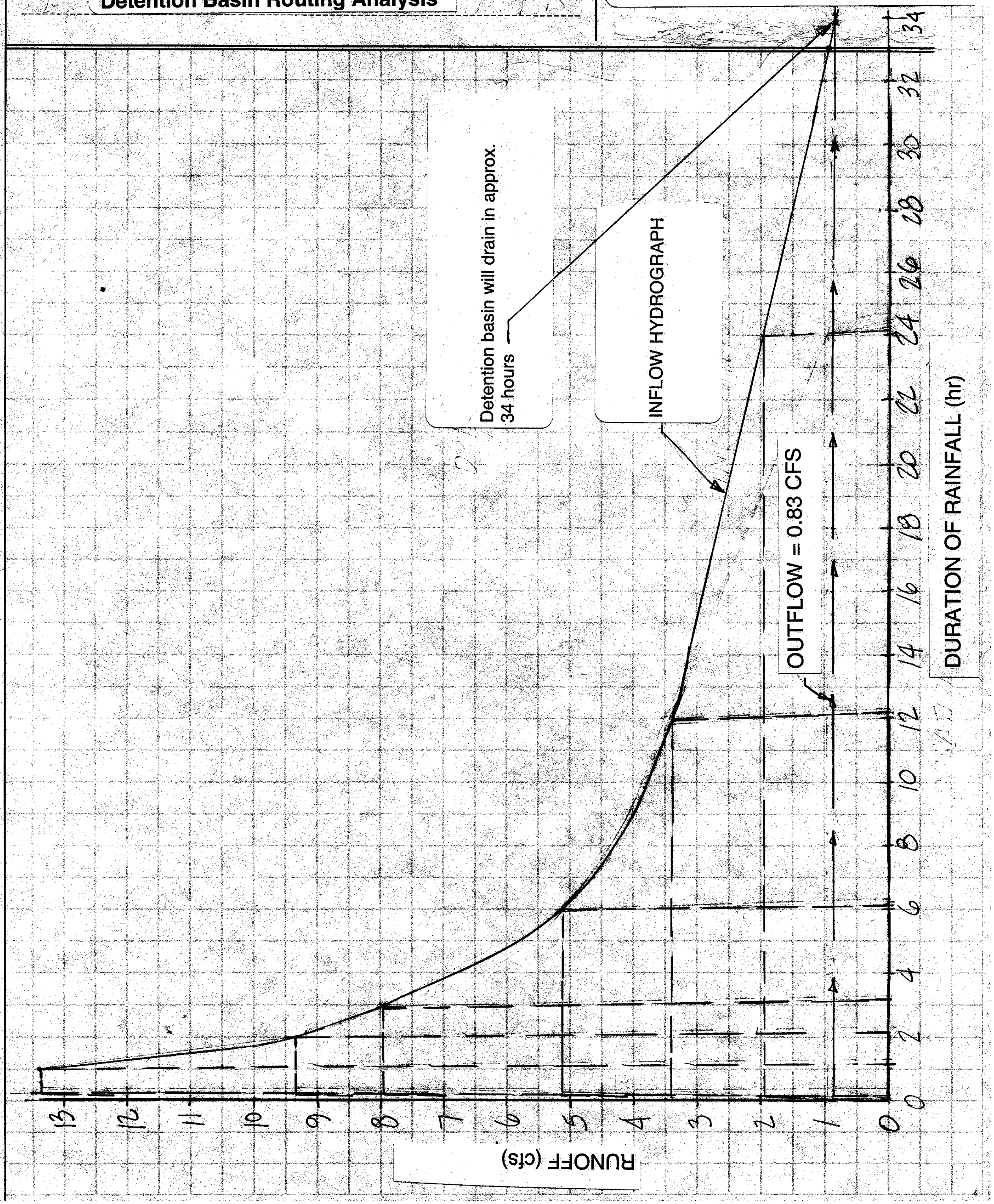
Sheet 4 of 7
Calc. No. 13578-C-1
Originator L. Gasparetti
Date 1/11/02
Checked by
Date



PARSONS BRINCKERHOFF COMPUTATION SHEET

Sheet 5 of 7
Calc. No. 13578-C-1
Originator L. Gasparetti
Date 1/11/02
Checked by
Date

Subject SMUD – Consumnes Power Plant
Detention Basin Routing Analysis



F. STORAGE VOLUMES

$V_{TC} = A_{TRAPEZOID}(60\ \text{sec/min})(Q_{in} – Q_{out})$
$V_{15} = ((5+24)/2)(60)(24 - 0.83) = 20{,}200\ ft^3$
$V_{30} = ((20+39)/2)(60)(18 - 0.83) = 31{,}700\ ft^3$
$V_{60} = ((50+63)/2)(60)(13.41 - 0.83) = 42{,}600\ ft^3$
$V_{3hr} = ((170+183)/2)(60)(7.94 - 0.83) = 75{,}300\ ft^3$
$V_{6hr} = ((350+363)/2)(60)(5.12 - 0.83) = 91{,}500\ ft^3$
$V_{12hr} = ((710+720)/2)(60)(3.47 - 0.83) = 113{,}300\ ft^3$
$V_{24hr} = ((1430+1440)/2)(60)(1.94 - 0.83) = 95{,}600\ ft^3$

PARSONS BRINCKERHOFF COMPUTATION SHEET

Subject **SMUD – Consumnes Power Plant Detention Basin Routing Analysis**

Sheet 7 of 7
Calc. No. **13578-C-1**
Originator **L. Gasparetti**
Date **1/11/02**
Checked by
Date